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A spider (*Lycosa*? sp.) (Araneida: Lycosidae) providing a shelter for its predator *Paracyphononyx ruficrus* (Klug, 1834) (Hymenoptera: Pompilidae)

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A spider (*Lycosa*? sp.) **(Araneida: Lycosidae) providing a shelter for its predator** *Paracyphononyx ruficrus* **(Klug, 1834) (Hymenoptera: Pompilidae). -** The pompilid wasp deposits its egg on the paralyzed spider's abdomen. The egg hatches, and the pompilid larva begins to feed on the host's body fluids. Before the larva reaches the fifth instar, the spider builds a silken cocoon around itself. Two days after cocooning, the larva finished devouring the entire spider. The behaviour of the victim (the lycosid spider) in providing shelter to protect its predator is recorded here for the first time.

Key-words: Lycosidae - Pompilidae - Paracyphononyx - Behaviour - Predation.

INTRODUCTION

In April 1977 and October 1980 an exciting behaviour shared by a lycosid spider and its pompilid predator could be observed in Egypt and it is described in this paper. Knowledge of the behaviour of pompilid wasps is poor, and "nothing is known of the biology of members of this genus (*Paracyphononyx*)" (Evans 1951). Poulton (1916) recorded observations by Dr Carpenter on the behaviour of a possible *Paracyphononyx* wasp, and Grout & Brothers (1982) described the hunting behaviour of *P. africanus* (Radoszkowski) but did not keep alive the spider for further observations. The author's observations could not be completed since then.

OBSERVATIONS

I. Cairo, Heliopolis, 1977.

18 March. A female lycosid spider (*Lycosa* sp. ?) had been captured inside my home and reared within a plastic petri dish.

30 March. The spider was very active and very fast in seizing its prey.

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31 March. A small whitish protrusion appeared in the abdomen's front. There was a movement inside the protrusion.

2 April. A small reddish larva had grown in the place of the protrusion on the left side of the abdomen's front. The spider's movement was not normal. It was something weak and it could not seize its prey (a domestic fly) during the first attack.

3 April. A piece of paper, curled around itself, had been introduced into th spider's container.

4 April. The spider was spinning inside the curled piece of paper making a closed chamber with two ends, one of silk threads and the other was the container's wall.

5 April. The spider was motionless inside its silken chamber. It had no abdomen but instead of it a big larva, which was devouring the cephalothorax. It was about 7 mm long, its diameter about 1.5-2 mm at the anterior half and 4-5 mm at the posterior half.

6 April. The larva devoured all the spider. It was outside the chamber trying to spin its cocoon. It was more than 10 mm long, and the diameter of the posterior half more than 7 mm. Moving in the container, it was trying to find apparently a better place for cocooning.

7-8 April. The larva spun in different places on the ground of the container but it could not build a cocoon without a suitable substratum.

15 April. It changed to a pupa without a cocoon, only under silken threads spread on the ground of the container.

16-27 April. Metamorphosis of the pupa.

28 April. The characteristic brown tibia of the third leg of this wasp species appeared.

29 April. Body length about 8 mm. Head and thorax black. Abdomen black dorsally and violet ventrally. At night, it moved on its back about 15 mm under silk.

1 May. An adult male wasp emerged. It was kept alive for a few days for watching its behaviour. It was identified as *Paracyphononyx ruficrus* (Klug, 1834) according to PRIESNER (1955).

II. Alexandria, El-Nozha Gardens, 1980.

22 October. I had found a female lycosid spider (*Lycosa* sp. ?) moving slowly on the ground with a small larva attached to the right side of its abdomen's front.

24 October. The specimen had been transferred in my laboratory to a petri dish containing seven pieces of paper, two of them were flat, two with one right angle, and three with two right angles settled in three different positions.

At night the spider spun inside one of the three pieces of paper with two right angles, with a roof and a ground of paper, a closed silken chamber, containing itself and the growing larva attached to its abdomen.

25 October. The spider lied motionless and activeless inside the chamber. The larva was bigger and still sucking fluids from the spider's abdomen.

In the afternoon, the larva moulted to fifth instar and began to devour the spider's body.

At night, the fleshy white larva began spinning its cocoon. Two pieces of paper were put beside, like as litter in nature and representing suitable substratum for cocooning.

26 October. The cocoon was constructed and the larva was still spinning inside it.

27 October. The cocoon became complete, about 9.3 mm long, elongated barrel shaped, its base flat, yellowish white in colour, with threads attached to the surrounding paper pieces.

15 November. After 19 days, an adult male *Paracyphononyx ruficrus* emerged from the cocoon, opening it by cutting the upper end as a lid.

DISCUSSION

Paracyphononyx ruficrus is recorded in Egypt from different localities, all the year round (STOREY 1916; PRIESNER 1955). Lycosidae (42 species, of 19 genera) are also recorded in Egypt from different localities (EL-HENNAWY 1992). Hence there are many lycosid species which may be victims of *Paracyphononyx ruficrus* in different localities of Egypt.

The preys recorded for other species of *Paracyphononyx* in Africa and North America are also Lycosidae, mostly without specific identification (IWATA 1976; GROUT & BROTHERS 1982). *Paracyphononyx* species hunt for lycosid spiders, paralyze the preys, and lay their eggs on them. There is no nest and no transportation of the prey. Hence, this simplified ethological type VPO (Hunting - paralyzing - oviposition) is indicated here according to IWATA's system (IWATA 1976; SHIMIZU 1994).

The observations written above lead us to some questions: How could the wasp sting its prey ? When did the spider recover after the sting ? Where was the wasp's egg laid ? How long did the egg stay before hatching ? and Why did the spider spin that silken chamber ? Is it a normal behaviour ?

1. In 1915, Dr Carpenter (Poulton, 1916) recorded the attack of a pompilid wasp (may be a *Paracyphononyx*) in Kakindu, west of the Lake Victoria (Tanzania), and thought that the spider was not stung. Apparently Dr Carpenter did not observe the (rapid) sting but he noticed that it "deposited an elongate ovum on the side of the spider's abdomen".

GROUT & BROTHERS (1982) recorded the attack, the stinging, the egg laying of *Paracyphononyx africanus* in Ndola (Zambia), and also the lycosid spider's recovery which took place about 20 minutes after stinging (contrary to the "few seconds", as in the case of Dr Carpenter's "hunting spider"). It is obvious that the time needed for recovery is depending upon the kind and quantity of the wasp's venom. Spiders recovering quickly avoid attacks of other predators, especially ants. No observations had been given on hatching by those authors.

2. Both Poulton (1916) and Grout & Brothers (1982) precised the position of the wasp's egg on the spider's abdomen. In the first case recorded here, no wasp's egg could be observed on the spider's abdomen during 13 days. Either the egg had been injected into the spider's abdomen or it was so tiny that I could not discover it during about two weeks. The injection of the wasp's egg inside the spider's abdomen may explain the long hatching time in comparison to other pompilid eggs [e.g. 2 days for *Dipogon sayi* (MEDLER & KOERBER 1957); 2-3 days for *Pseudopompilus humboldti* (EL-HENNAWY 1986); 4-5 days for *Pepsis thisbe* extended to 10 days in cooler conditions (WILLIAMS 1956)].

An important question arises: "Why did the spider spin that silken chamber ?" Lycosid spiders use silk mainly during locomotion, moulting, courtship, spermweb and cocoon construction (RICHTER 1970) and "A few species of wolf spiders (*Aulonia*, *Hippasa*), ..., actually build webs reminiscent of the sheet webs of agelenids." (FOELIX 1982). "They are generally characterized as "vagrant hunters" in that, with two exceptions (the genera *Sosippus* and *Aulonia*), they do not build webs for prey capture. Wolf spiders do use silk in making dragline, making sperm webs, wrapping their eggs, ballooning, and in some groups, in lining the burrow." (STRATTON 1985). Also, lycosid spiders of the genus *Venonia* construct sheet webs in Australia (ANDERSON 1988).

The chamber described here reminds us of the closed nursery cocoon of *Dysdera* (under the surface of the earth) and *Cheiracanthium* (on plants) constructed by the female and where it lives inside with its eggs.

DAY (1981) described a similar interaction between *Pompilus cinereus* (Fabricius, 1775) and its lycosid prey which "recovers from paralysis between 3 and 6 hours after stinging and begins to walk aimlessly about the cell spinning silk continuously. After 3 days, when the wasp first instar is ready to emerge, the spider and the wasp egg are contained within a silk-lined cell of considerable structural integrity." The silk cell lining "may serve to prevent collapse of the cell as the sand dries out" and "to protect the prey from flooding during periods of rain".

It's a cell to protect the pompilid egg and larva, prepared by the prey as a shelter for its predator. This seems to be an unusual behaviour. Here, "the spider seems to have followed the original "program" coded in its CNS" (FOELIX 1982) under the influence of the pompilid larva.

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